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ABSTRACT

The research design is described for the study of instructional time, conducted as part of the Beginning Teacher Evaluation Study. The premise of the study was that certain teacher behaviors are related to student achievement; however, if all teacher behaviors are equal, the students who spend the greatest amount of time in learning activities will learn the most. Another variable of interest, the students' rate of learning, is also discussed. The goals of this study, which focused on second grade students, were to: (1) describe the amount of student time spent in various instructional settings, categorized according to teacher involvement, pacing, and group size for several categories of curricular content; (2) describe these distributions of time for reading and mathematics, for students within the same class, over several days for the same student, and for students in different classes; (3) describe the relationship between time spent in instruction and student achievement in reading and mathematics; and (4) develop procedures for the collection of time-in-setting data. The definition of the variables and descriptions of sampling and data analysis procedures are presented. Data collection activities included achievement tests, daily logs recorded by the teachers, and direct observation. (Author/GDC)

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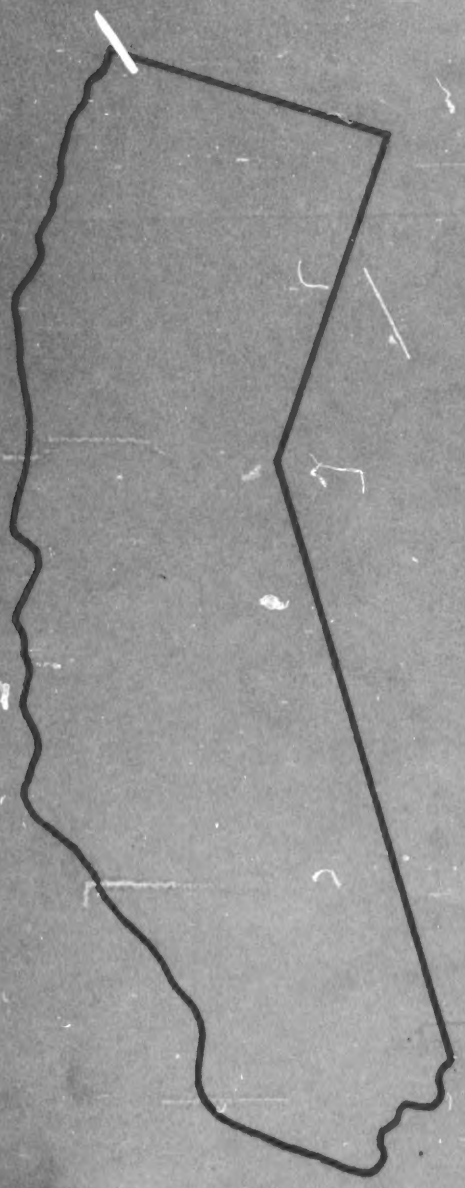

BTES

BEGINNING TEACHER EVALUATION STUDY

Technical Note Series

TECHNICAL NOTE II-1

Continuation of Phase III A

DESIGN FOR A STUDY OF INSTRUCTIONAL TIME

August 15, 1975

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DESIGN FOR A STUDY OF INSTRUCTIONAL TIME

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DESIGN FOR A STUDY OF INSTRUCTIONAL TIME

This technical note describes the work to be undertaken in Task II of the Phase III A Extension of the Beginning Teacher Evaluation Study. The BTES document entitled Program Plan For Continuation of Phase III A BTES (May 23, 1975) outlines six tasks to be accomplished during 1975-76. Task II in that document is the starting point for the design of the instructional time study. It is important to note that Tasks II and III overlap in terms of the sample of students and teachers participating in the studies. The soundness of both of these tasks has been taken into consideration when design decisions were made. Where necessary for clarity, other documents relevant to Tasks II and III will be cited.

Introduction to the Problem. Present indications suggest that instructional time is potentially a very important variable in understanding the effects of instruction on student learning. In several studies positive correlations have been found between time-in-instruction and student achievement. The strength of this relationship is difficult to assess at this point. In some cases the instructional time variable has been defined as amount of schooling (e.g. Wiley & Harnischfeger, 1974) which takes into account variations in length of school day and absentee rates. Other studies (e.g. Harris & Serwer, 1966) have related the amount of instruction offered in a particular subject area to achievement. The concept of instructional time has been further refined in a few studies where attempts have been made to assess the amount of time students actually engage in learning activities in a particular subject area (e.g. Carroll & Spearett, 1967; Hess & Takanishi 1974; Stallings & Kaskowitz, 1974). There are not enough of these studies from which to draw firm conclusions and in most cases the assessment of the

time variables depends on self report rather than observation. If the studies which account for the amount of instructional time (in one way or another) are taken as a whole, then a trend emerges. This trend, although not yet well established suggests that the more precise the measure of time of direct instruction, the stronger the relationship between time and student achievement. Given that this trend is a real one, the instructional time concept is of great importance in the study of instructional effects.

The instructional time point of view is a most useful one in that many of the variables considered important to classroom instruction can be cast in terms of time variables (see Carroll, 1963; Harnischfeger & Wiley, 1975). Since many aspects of instructional settings, student activities, and teacher activities can be defined as time variables, it is of crucial importance to develop practical procedures for describing instruction in these terms and to have more direct evidence of the relation between instructional time and student achievement.

The amount of learning exhibited by students is a function of both the amount and kind of instruction they receive. If two groups of similar students are receiving precisely the same kind of instruction and if mastery of the objectives has not yet been reached, then the group which spends more time on the task will outperform the group which spends less time on the task. Differences in achievement will be attributable to variation in the amount of instruction, other things being equal. An implicit assumption in this statement is that the learning rates for similar students are identical if the instruction is of the same kind. If the instruction is not identical for two groups of students, then the amount of learning is a function of learning rate (due to kind of instruction) as well as amount of instruction. In studies of the relative effectiveness of different kinds of instruction, these two sources of variance in

learning have not always been taken into account. The relative importance of differences in learning time and learning rate are not at all clear. If learning rate is much more important than learning time in explaining achievement, then one could expect to find consistent relations between achievement and kind of instruction received. If the factors are about equally important or if learning rate is less important than learning time, then the relation between achievement and indices of kind of instruction would appear to be inconsistent and extremely difficult to interpret when learning time is not accounted. In this latter case (and the educational research literature may be described as conforming to this situation) it is necessary to assess the effect of learning time independently or to partial out the effects of learning time before trying to establish relations between achievement and kinds of instruction. The overall purpose of this study (Task II) is to address this issue. Though we are ultimately interested in studying the effectiveness of various teacher behaviors and skills (indices of the kind of instruction) it is necessary to first assess the impact on learning of differences in learning time (amount of instruction).

In field research it is not possible to completely separate the amount of instruction from the kind of instruction. In fact, the kind of instruction must be specified at some level before it is possible to discuss amount of instruction. Part of this difficulty may be referred to as the specificity problem. At a very global level, instruction can be defined as whatever a student engages in during school hours. On the other hand, distinctions could be made on the basis of content, group size, teacher behaviors, materials used, social climate, or physical arrangements among others. Clearly the number of kinds of instruction is practically limitless. The approach taken here is to define broad kinds of instruction (settings) and to study the relationship between the amount of learning time spent in these settings and

student achievement. The next step would be to study teacher behavior and skills within particular settings.

This study deals only with the first of these steps. The kind of instruction is defined in terms of four characteristics; content, teacher involvement, pacing and group size. Using these facets, we partition instruction for a particular student into a number of instructional settings. The general goal of this study is to describe the instruction which students receive in terms of the time each student spends in each of the settings and to relate these quantities to measured learning. More specifically the goals of this study are:

1. To describe the distribution of student time spent in instructional settings defined by teacher involvement, pacing, and group size for several categories of content.
2. To describe these distributions for reading and mathematics over
    a. students within the same class
    b. several days for the same student
    c. students in different classes
3. To describe the relationship between time spent in various instructional settings and student achievement in reading and mathematics.
4. To develop practical procedures for the collection of time-in-setting data.

Dependent Variables. The major dependent variables for the study will be achievement in reading and mathematics. The achievement variables will include subscales for reading (for example decoding, context clues, word structure, word meaning and comprehension) and mathematics (for example: computation, concepts, problem solving, and speed of computation). The measures of all these variables will be group administered paper and pencil tests. The test items have undergone preliminary revision and refinement during Phase III A (1974-1975). The tests to be used are the interim versions of those being studied for use during Phase III B. The specific items, development history, and data from pilot testing are included in Technical Report III-1: Development and Refinement of Reading and Mathematics Tests for Grades 2 and 5 (August 1975).

The tests described in Technical Report III-1 will be used to assess student learning over an eight week interval in all classes participating in the study. In addition, achievement will be measured over a two-week interval in a subsample of six classes. The measures in this latter case will be similar to six of the subtests included in the main battery. The items constituting the scales to be used over the two week interval will, in general, be parallel to those included in the longer battery.

Although cognitive achievement is the focus of the study, scales measuring student attitude to mathematics, reading, and school will be administered. The purpose of these scales is to check for possible large changes in attitudes over the school year and for relations with the cognitive measures.

Process Variables. The process data will consist of time-in-setting information for individual students. Data will be collected for all students in each of the classes participating in the study. Instructional settings are defined in terms of four facets: teacher involvement, pacing, group size and content.

The teacher involvement facet has two elements. We want to distinguish those settings in which students work directly with a teacher from those situations where a teacher's primary attention is not on the student or students being considered. The term teacher is used here in the broad sense and includes any adult directly involved in instruction. If a class is divided into two groups at some particular point in time and one of the groups is engaged in a reading circle with the teacher while the other group is doing seatwork, the students in the reading circle would be in a setting with direct teacher involvement. The students who were doing seatwork would be in a setting which did not involve a teacher directly. This would be the case even though the teacher may occasionally address one or more of these students. Consider another situation where students are engaged in seatwork and the teacher's main activity consists of going from student to student to check their work or to explain what is to be done. In this case the setting is characterized as having a teacher directly involved even though the teacher does not necessarily interact with all students in the group. We partition instruction into that portion which directly involves a teacher and that portion which does not. This facet is an important one since the impact of teacher behavior and skills is potentially higher in the former than in the latter.

The pacing facet is included to distinguish between settings in which students proceed at their own pace and settings in which the student works at a pace determined by the teacher or some other characteristic of instruction.

Pacing is very much a matter of degree since students never completely determine their own pace nor is pace completely determined by an external factor. Nevertheless, instructional settings vary considerably in this respect and as a result the rate of student learning may be strongly affected. As a crude operationalization of pacing, we have chosen to distinguish between seatwork and group work. Seatwork is the most frequently occurring setting in which students have relatively high control over pace; group work is the situation which is most externally paced.

The third facet of instructional setting used in this study is group size. This facet has been the subject of much research in education and has much intuitive appeal. It is included here not becuase of its potential direct effect on learning, but because different group sizes provide the opportunity for very different kinds of student activities, teacher behaviors, and group climates. The mere fact that a student is working in a small group does not imply that a particular kind of instruction will take place. What it does do is act as a necessary but not sufficient condition for different teacher behaviors. For instance, the smaller the group, the more closely a teacher can approximate a tutoring situation with each student. However, a lecture to a group of five children is probably very much like a lecture to a group of thirty-five children.

Since instruction is planned and implemented by content area, and student achievement is most often differentiated by content area, instructional settings are partitioned by content category. Reading and mathematics are our main interests, therefore, we describe instruction in terms of the subareas of reading (ex: decoding and word structure) and mathematics (ex: addition with regrouping, subtraction with regrouping, place value). The specific categories of content are included in Appendix A. Each category of reading has

been identified and the glossary in Appendix A describes each. Similar information is included for the categories of mathematics content.

The time that students spend in the settings defined by these facets will be recorded in two ways. First the information will be obtained from teacher logs over a period of eight weeks of instruction. Second, for six of the classes, time-in-setting information will be collected by direct observation over a period of two weeks. In both of these situations, time spent in settings defined by the four facets will be collected. In cases where the content changes relatively quickly, content will be coded within settings defined by teacher involvement, pacing and group size. Subsequently, this time will be distributed equally over the coded content categories. In cases where it is feasible, time notations associated with content changes within particular configurations of teaching involvement, pacing and group size will be made. The details of both these procedures (the teacher logs and the direct observation) are presented in Technical Note II-2: Instruments for the Study of Instructional Time.

Sample. The study will be carried out in grade 2 classrooms. Only one grade level is included for reasons of economy. Grade 2 seems most appropriate since it is one of the grades being studied by BTES and because there is likely to be greater diversity in the distribution of time allocated to instruction at this grade level compared to grade 5. In a given period of time there is likely to be more new content introduced at grade 2 than at grade 5. This is particularly true in reading. By the fifth grade most of the reading skills have been covered and the focus of instruction is often on consolidation of these skills. This implies that achievement gains due to instruction may be easier to detect at the lower grade level. This point was supported in the ETU data collected during 1974-1975 where for both mathematics and reading the gains at grade 2 were greater than those at grade 5.

In order to make data analysis reasonably powerful on the one hand, and to keep the data collection manageable by a small staff on the other, fifteen classes have been recruited for the study. We will conduct six hours of student testing in each classroom and complete 2 weeks of observation in six of the classrooms.

This sizeable commitment from teachers and students necessitates special recruiting procedures. Fifteen 2nd grade teachers have been recruited from schools in northern California for participation in both Task II and Task III. A minimum of ten teachers will take part in the instructional time study. During the first week of September, project staff will meet with each of these teachers and describe the requirements of Task II in detail. Of the teachers who volunteer to participate the project staff will choose six for the direct observation subsample. The choice will be made so that the common content covered in mathematics and reading during the fall is as extensive as possible. A number of additional constraints will be imposed where possible; only one class per school, diversity in the background characteristics of the students, and a

minimum of fifteen grade 2 students in each class.

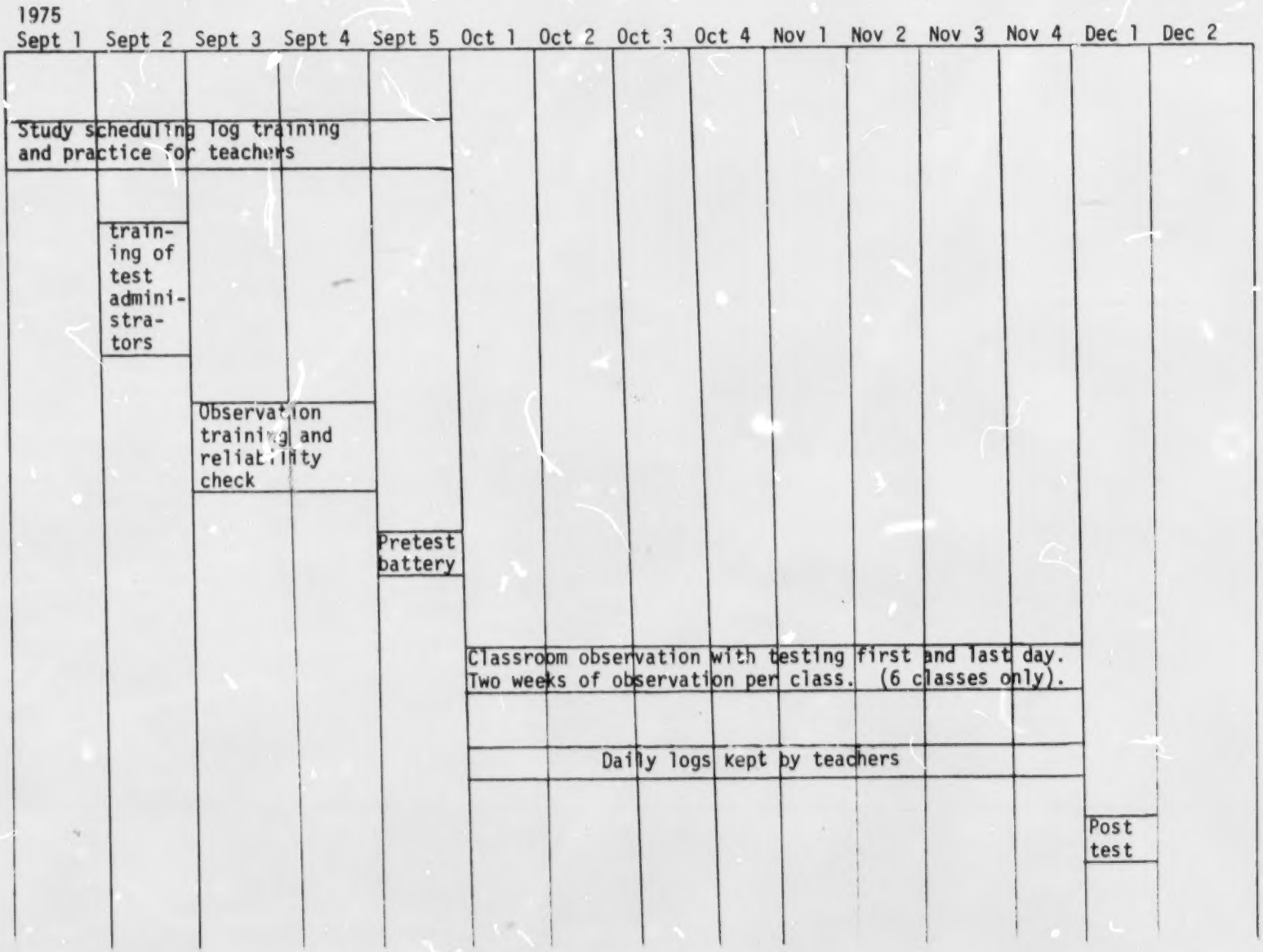
Teachers in Tasks II and III will be offered an honorarium of $50 or will be awarded extension credits for participation in the studies. The teachers in the observation subsample will be given an additional $100 honorarium for cooperation during the period of direct observation. It will be necessary for all teachers to spend time in preparation for log and record keeping activities associated with the study. In addition to the above honoraria teachers will be paid $10 per week for completion of logs. Since the study will cover twelve weeks of school instruction, the maximum monetary incentive for teachers will be $170. ($270 for teachers in the observation subsample). At the end of the field work, each classroom will be presented with a learning materials package in recognition of their cooperation. The field work associated with Task II will be completed in early December 1975. However, all of the teachers will be involved in Tasks III activities until March, 1976.

Procedures. Three types of data will be collected during this study. First, the dependent variable battery (see Technical Report III-1) will be administered at two points in time. These administrations will be conducted by FWL staff during the week of September 29th and the week of December 1st creating an eight-week intertest period. These and other field activities associated with the study are presented in Table 1. Each administration of the battery requires two one and one-half hour testing sessions. Each of these sessions is constituted by sixty minutes of testing time, fifteen minutes of directions, distribution and collection of materials and fifteen minutes of rest period. Training for the FWL staff members on administering the battery will be conducted during the second week in September in grade 2 classrooms not involved in the study of instructional time.

The second source of data in the study will be teacher logs. Training sessions will be held with each of the teachers during the second, third and fourth weeks of September. Each teacher will be introduced to the log procedure and asked to begin keeping daily records. Teachers will be visited several more times during this three-week period so that feedback can be given on the record keeping. The log procedure itself is described in Technical Note II-2: Instruments for the Study of Instructional Time. From our pilot testing of the log procedure, it became clear that the ease with which information on classroom activities can be recorded varies from teacher to teacher. In classes which are highly individualized, the log required more time to keep, and a modification was devised which provides less data than the regular log procedure. Even for the regular procedure. we expect some teachers will require more time and training in order to produce usable data than other teachers. Since the teachers will begin keeping logs after their first contact with FWL staff in the second and third weeks of September, there will be time for feedback sessions with each teacher

TABLE 1

TIME LINE FOR FIELD ACTIVITIES RELATED TO TASK II



before the pretesting is completed (in the last week of September). In this way each teacher will have kept logs for an average of ten days before "real data" are collected. This should give adequate time for coping with idiosyncrasies which are found in any of the programs. The teachers will keep the logs during the entire eight week intertest period. Frequent contact will be maintained for collection and feedback purposes during this time.

The third source of data for the study will be provided by direct observation. Each of the classes of the six teachers in the observation subsample will be observed for two full weeks (10 days of instruction) during the intertest period. In each case the observation will be scheduled in advance after consultation with the teachers. We will pick the two week period within the eight week interval during which addition with regrouping is being introduced to the grade 2 students. This will mean that all of the teachers will not be observed during the same two week period. However it will ensure that the content being focused on in mathematics is similar across all classes. This is an important point since several short tests on specific content in mathematics and reading will be administered on the first and last days of observation. We have chosen to select the observation timing on the basis of the mathematics content because our experience in schools indicates that the areas of mathematics instruction are relatively easier to predict in time (since they are essentially sequential) than the areas of reading (which tend to be taught in different orders depending upon the curriculum). This point is made somewhat stronger since there is only one state adopted mathematics curriculum but several different reading curricula. Having fixed the time of observation in this manner, we will carry out the data collection using the observation system described in Technical Note II-2: Instruments for the Study of Instructional Time. Three observers will be trained during the third and fourth weeks of September and reliability will be established before

data collection begins. The observation system requires that the observers be familiar with the general pattern of instruction in a particular classroom as well as be able to distinguish the students in a class from one another. These requirements will be met by having the observer spend a minimum of two days in the classroom to be observed before the beginning of official data collection. During this preliminary time the observer will familiarize himself with the students, materials, and organizational patterns used by the teacher. Idiosyncrasies of that particular classroom may be incorporated into the coding system and the teacher and students will have a chance to get used to having an observer present. Although observation data will be restricted to those instructional settings which relate directly to mathematics or reading, the observers will remain in the classroom for the entire school day. This will allow the coding of mathematics and reading instruction and practice which occurs outside of regularly scheduled mathematics and reading periods. This is an important condition since, mathematics and especially reading instruction turn up at many times during the day. The tests administered on the first and last days of observation will be selected from the overall test battery. In reading, subtests measuring knowledge of long vowels and compound words will be given. A general measure of decoding skills will also be included. This last measure will be constructed by sampling two items from each of the decoding subtests in the main test battery. In mathematics three subtests will be given measuring achievement in subtraction without regrouping, addition with regrouping and place value.

Data Reduction and Analysis. The data obtained on student performance on the test battery will be handled in a straight forward fashion. The test booklets will be returned to the FWL, punched on cards edited, and scored. This procedure will yield a basic matrix containing scores for each student on all of the subtests of the test battery for each of the two testing occasions. We do not plan to administer make-up tests for students who are absent on one or more of the testing occasions. Students with incomplete data will be deleted from the matrix of test scores. Since there are 15 classes and approximately 30 students per class, a total of 450 students will take the tests. Assuming 10 percent loss of subjects due to missing data, the useable test score matrix will contain data for approximately 400 students. The usual item analyses and descriptive data for each of the subscales will be computed and examined before this matrix is used in further analysis.

A second data matrix will be generated from the teacher log data. This matrix will contain a vector of time-in-settings for each of the students. There will be little or no attrition of students in this matrix since the logs will provide setting data on all students.

The raw logs will be returned to the Laboratory and coded in the following manner. The amount of time spent in each instructional setting for each student will be calculated. The first step in this procedure is to identify each event in which a particular student was involved. An event is an amount of time in a particular setting where setting is defined by content, teacher involvement, pacing, and group size. For any one student, all of the events codable from the eight weeks of teacher logs will be identified and punched onto cards. This will yield a string of events for each of the students in the study. Each event in a string will consist of the setting designation and the amount of time the student spent in that setting as recorded in the teacher log. The length of these event strings will vary from

student to student since over eight weeks the instructional program, absences, etc., will vary from class to class and from student to student within any particular class. The next step requires the sorting of the events in any one string so that the time spent in a particular setting over the whole eight weeks is accumulated. At this stage, a matrix can be formed with rows representing students and columns representing each of the unique settings. The entry in any column represents the total time during the eight weeks of instruction that a student spent in that particular setting. This matrix need only be constructed for those students who have complete test data. The descriptive statistics associated with this matrix will be of interest in their own right. However, the first analysis starts with the matrix of test scores and the matrix of setting times. The analyses which can be done are numerous. The general strategy is to select a dependent variable from the matrix of test scores and the matching time variables from the matrix of setting times and carry out a regression analysis. For example, if scores on consonant blends (part of decoding) were chosen as a dependent variable, one would select all of the setting variables related to consonant blends and collapse across them. This would allow an analysis of scores on consonant blends in terms of time spent in that content category. Time spent in other related content areas could also be added to the regression analysis. Analyses can be further complicated by using setting times which are not collapsed over group size, pacing or teacher involvement. Beyond the first set of analyses, (achievement in a content area related to time spent in matching and related content settings) it is not immediately obvious which other analyses would be most productive, but the general strategy is clear.

A third and fourth data matrix will be generated from the observation subsample. The first of these will be a test score matrix analagous to the

matrix of test scores mentioned earlier. In this case there will be about 180 students in the six classes and after attrition there will be test data for approximately 150 students. This matrix will have twelve columns corresponding to the three reading scores (long vowel sounds, compound words and decoding) and three mathematics scores (subtraction without regrouping, addition with regrouping, and place value) each of which will have been measured at two points in time. Since these variables are relatively narrowly defined and the testing interval is only two weeks it is probable that some students will have mastered the content before the first testing. This is likely to happen since any grade two class has a relatively wide range of ability represented in it. It will be impossible then, for some students to show change on these measures. As a result these students will be deleted from the matrix of test scores which may further reduce the sample for analysis purposes to about 120. From the observation data, a matrix of time-in-setting variables analogous to the matrix generated from the logs can be constructed. Precisely the same steps will be followed to arrive at this matrix. Again this matrix will have data on 180 students since the observation will be done on all students in the six classes.

Two types of analyses will be carried out. First, the appropriate rows (students) will be deleted so that the observation data matrix matches the small matrix of test scores and a series of regression analyses analogous to those described above can be conducted. The goal of these analyses (using a two week testing interval and direct observation data) is precisely the same as that for the analyses described earlier (using an eight week test interval and teacher log data).

Second, the matrix of setting times based on the direct observation data will be compared with the teacher log data corresponding to the same time period in order to partially validate the teacher log procedure. It is

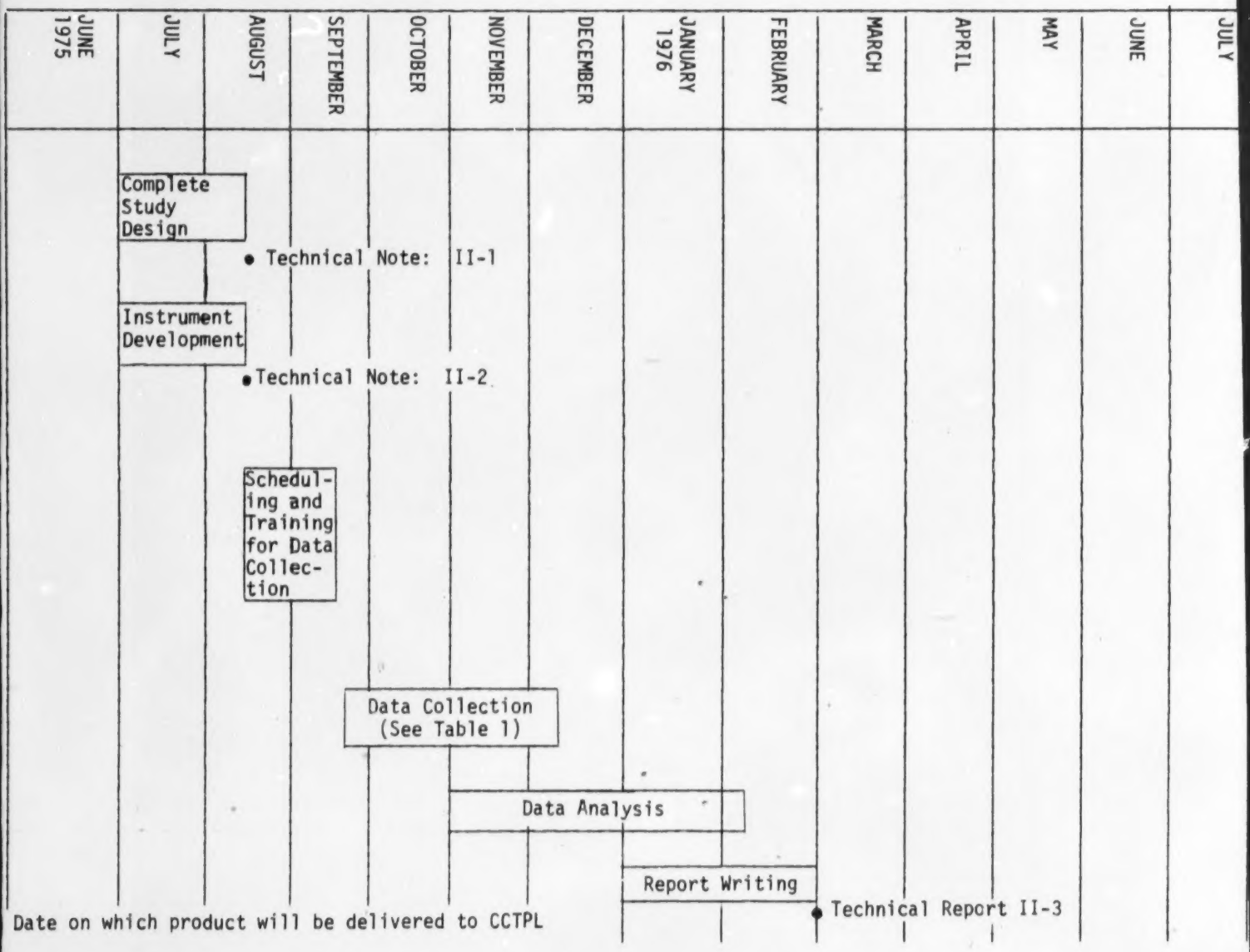
possible that the teacher reports of student setting times will not approximate the times directly observed. If so, then the analyses carried out using teacher log data would be suspect. Clearly, it would be desirable to make this check between setting time data based on teacher logs and that based on direct observation before carrying out any of the eight week analyses.

In any case, an analysis relating achievement over the eight week period to the setting data collected by observation will be undertaken. The strategy for the analysis is again like that described earlier.

The time frame for the study, including analysis and reporting phases as well as the data collection phase is presented in Table 2.

TABLE 2

TIMELINE FOR TASK II: STUDY OF INSTRUCTIONAL TIME



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APPENDIX A

Content Categories and Glossary

READING CONTENT CATEGORIES

I. DECODING (Letter-sound correspondence)

1. Single consonants
2. Consonant blends and digraphs
3. Variant consonants (c, g)
4. Vowels - short
5. Vowels - final e pattern
6. Vowels - digraphs
7. Vowels - dipthongs
8. Vowels - vowels + r (car)
9. Complex, multisyllabic
10. Silent letters
11. Sound substitution tasks
12. Sight words
13. Automaticity of word recognition
14. Other

II. CONTEXT CLUES (Fill blanks, predict)

1. Choosing word(s) which fit grammatical context
2. Choosing word(s) which make best sense (semantic appropriateness)
3. Choosing correct form of word
4. Choosing word with correct initial consonant
5. Choosing correct pronoun
6. Other

III. WORD STRUCTURE

1. Compound words
2. Identification of root words
3. Prefixes - meaning and use
4. Suffixes - meaning and use

(III. WORD STRUCTURE - Continued)

5. Contractions
6. Syllables
7. Other

IV. WORD MEANING

1. Synonyms
2. Antonyms
3. Vocabulary building
4. Pronoun reference
5. Multi-meaning words in context
6. Unfamiliar words in context
7. Figurative language
8. Other

V. COMPREHENSION - TEXT

Understanding -

1. Event detail
2. Description
3. Relationships
4. Main idea
5. Literal recall
6. Translation of ideas
7. Synthesis of ideas, inference
8. Going beyond the text, prediction
9. Recognizing facts and opinions
10. General comprehension

VI. APPLICATION

1. Understanding directions
2. Picture interpretation to aid comprehension

(VI. APPLICATION - Continued)

3. Dictionary skills
4. Reference sources in books (table of contents, index, glossary)
5. Choosing reference sources (dictionary, encyclopedia, card catalog)

Understanding

6. Signs
7. Letters
8. Maps
9. Graphs
10. Reading for different purposes
11. Oral reading skills
12. Reading for enjoyment

VII. READING RELATED

1. Spelling
2. Grammar
3. Creative writing

READING GLOSSARY

I. DECODING (knowledge and use of letter-sound correspondence)

1. Single consonants -
   Sounds of single consonants in any position in a word.
   Examples: b,c,d,...

2. Consonant blends and digraphs
   Blends include st, bl, tr,...
   Digraphs include ch, sh, th, wh.

3. Variant consonants
   A comparison of several sounds possible for a single consonant.
   Examples: "c" in cat vs city, "g" in goat vs giant

4. Vowel - short
   Regular short sound of a, e, i, o, and u

5. Vowel - final e pattern
   Long vowel sound when word ends with e, as in rope

6. Vowel digraphs
   Include ee, ea, ai, oa, and ay

7. Vowel dipthongs
   Include oi, oo, ou, oy, au, and aw

8. Vowel plus r
   Vowel sound modified by following consonant r
   Examples: ar, er, ir, or, ur, air, ear

9. Complex, multisyllabic
   Decoding of multi-syllabic words, includes internal patterns, syllable influence on vowel decoding

10. Silent consonants
    Letters which are not sounded in a word
    Examples: comb, knit

11. Sound substitution tasks
    Substituting one sound for another to create a new word.
    Example: fan, _an, p, pan

12. Sight words
    Recognition of common words, especially function words (the, of, to, would, could, were) and words with irregular spelling (are, come, put)

13. Automaticity of word recognition
    Practice to improve speed of word recognition, so that the process becomes automatic.

II. CONTEXT CLUES

Context clues involve using the context of a phrase, sentence, or story to help identify a word or to predict a missing part. Different types

of context clues emphasize different aspects of the linguistic context or of the word to be identified.

1. Choosing word(s) which fit the grammatical context.
   Father is sleeping _____ the bed.
   night
   in
   warm

2. Choosing the word(s) which make best sense in the blank.
   The _____ lives in the royal palace with her father.
   princess
   prince
   sister

3. Choosing the correct form of a word.
   Both of the _____ are asleep.
   baby
   babying
   babies

4. Choosing the word with the correct initial consonant.
   Don't _____ the milk.
   sill
   spill
   still

5. Choosing correct pronoun.
   John dropped his book and then picked _____ up.
   them
   it
   him

III. WORD STRUCTURE

1. Compounds
   Words formed by combining two smaller words - "mailbox"

2. Identification of root words
   Recognizing the root word in a derived form - "playing" root = play

3. Prefixes -
   Include re-, un-, dis-, pre-...

4. Suffixes
   Include grammatical endings like -s, -ed, and -ing and other suffixes like -ly, -ful, -ness, -less...

5. Contractions
   do not = don't

6. Syllables - separation of a word into sound units preamble = pre am ble

IV. WORD MEANING

1. Synonyms
   Identifying words with similar meanings - quick = fast

2. Antonyms
   Identifying words with opposite meanings - large vs. small

3. Vocabulary building
   Learning word meanings

4. Pronoun reference
   Identifying the referent of a pronoun.
   "John washed his car." his=John's

5. Multi-meaning words in context
   Identifying the specific meaning of a word in a particular context.
   I cut my hand on a piece of paper.
   a. part of a clock
   b. part of a person
   c. give something

6. Unfamiliar words in context
   Deducing the meaning of an unfamiliar word through its use in context.
   The car was so badly entrenched in the mud that we had to call a tow truck.
   a. stuck
   b. built
   c. dirty

7. Figurative language
   Recognizing the meaning of a word or phrase used in a nonliteral sense, including simile, metaphor, and idiomatic expressions.
   The soldier fought like a tiger to protect his home.
   a. in a striped uniform
   b. with sharp claws
   c. bravely and fiercely

Oh, how Peter wished he could whistle! Peter saw his friend Sam playing with a dog. Whenever Sam whistled, the dog ran straight to him. Peter wished he could do that trick with his own dog, Willie. Peter tried and tried to whistle, but he just couldn't.

Peter went into his house and put on his father's old hat, to make himself feel more grown-up. He looked into the mirror to practice whistling. Still no whistle!

The next day Peter went outside to play. He sat on the front steps and tried to whistle. Then Peter saw his dog coming. Quick as a wink, Peter hid behind the stairs. He wanted to surprise Willie with a whistle. Peter puffed up his cheeks. He blew and blew and blew. Suddenly, out came a real whistle. Willie stopped and looked around to see who was making the noise.

"It's me," Peter shouted. He jumped out from behind the stairs. Willie raced straight up to him.

The following illustrations refer to the story above.

V. COMPREHENSION

1. Understanding event detail. What did Peter put on?

2. Understanding description - Where did Peter hide?
   How did Peter feel at the end of the story?

3. Understanding relationships - What happened first?
   Why did Willie stop and look around?

4. Understanding the main idea - What is the story mostly about?
   What lesson can we learn from the story?

5. Literal recall - recall of information exactly as stated in the story.
   What did Peter wish he could do?
   a. have a dog
   b. whistle
   c. go to school

6. Translation of ideas
   Recognizing ideas stated in different words; ability to paraphrase; recall of information when ideas are restated.

   What happened when Sam whistled?
   a. Peter went over to see Sam
   b. A dog went over to see Sam
   c. Peter whistled too

7. Synthesis of ideas, inference
   Ability to integrate information from different points in a text; understanding ideas directly implied by a text.
   What trick did Peter want to do with his dog?
   a. teach Willie to whistle
   b. put an old hat on Willie
   c. whistle to call Willie

8. Going beyond the text, prediction
   Relating the text to one's own knowledge and experience; supplying from experience information not directly given in a text. Includes predicting what might come next in a story.
   How did Peter feel when Willie came running?
   a. happy
   b. scared
   c. mad

9. Recognizing facts and opinions
   Evaluating statements and the basis for their acceptance. Included evaluating the qualifications of a speaker.
   Which of the following is a fact rather than an opinion?
   a. The Etruscans built cities long ago.
   b. The jewelry made by the Etruscans was the most beautiful ever made.
   c. Historians do not know as much as archeologists do.

10. General Comprehension
    Silent reading or general reading practice, where comprehension involves a mixture of the facets above: (Please use one or more of the specific categories, if possible.)

MATHEMATICS CONTENT CATEGORIES - GRADE 2

I. COMPUTATION

1. Addition (sums to nine)
2. Addition (sums 10 to 18)
3. Addition (sums greater than 18 without regrouping)
4. Addition (sums with regrouping)
5. Subtraction (two one-digit numbers)
6. Subtraction (one digit from a two-digit number which is no greater than 18)
7. Other subtraction without regrouping
8. Subtraction with regrouping
9. Multiplication (two one-digit numbers neither greater than five)
10. Multiplication (two one-digit numbers only one of which is greater than five and less than ten)
11. Number sentences involving equalities and inequalities
12. Family of facts (renaming numerals)

II. CONCEPTS

1. Number systems
2. Place value, compact and expanded notation
3. Fractions
4. Properties
5. Money
6. Linear measurement
7. Measurement concepts
8. Geometry (figures/curves/points)

III. WORD PROBLEMS

IV. OTHERS

1. Number patterns

MATH GLOSSARY - GRADE 2

A. Number sentences: equalities and inequalities
Determining what sign is missing in an equation or number sentence. Primarily involving the signs of $>$, $<$, and $=$. But may also involve + and -.

Examples: $5 \bigcirc 4$
$2 + 1 \bigcirc 3$
$3 \bigcirc 4 = 7$

B. Number patterns
Emphasis is on completing the pattern and/or discovering the rule. May ask "What is the next number?" or "What rule did you use to find the missing number?"

Examples: a. 2, 4, 6, ?, ?, 12 (series)

b.

2	3	4	?	?
4	6	?	?	12

(input/output function)

c.

4	?	10
3	5	?
?	11	18

(magic squares)

d. [(1,3) (2,4) (?,5) (?,?)] (set of number pairs)

C. Properties
Situations often arise in the teaching of basic facts, computation, etc where particular items may illustrate certain basic properties. However, for the log, we are interested in lesson segments where attention is given or drawn to a particular property or the lesson involves a series of computational items which involve application/use of a property.

1. Commutative (order): emphasis or attention at this stage is focused on the reversability of order.
Examples: $2 + 4 = 4 + 2$
$3 \times 2 = 2 \times 3$
or $6 + 1 = 7$, $1 + 6 = 7$ (when these equations appear together and attention is drawn to reversability)

2. Associative (grouping): manner in which numbers are grouped does not affect sum.
Examples: $(2 + 3) + 5 = 5 + 5$
$2 + (3 + 5) = (2 + 3) + 5$
or can be combined with expanded notation:
$78 + 2 = 70 + (8 + 2)$
$= 70 + 10$
$= 80$

$38 = 30 + 8$ so
$38 - 5 = (30 + 8) - 5$
$= 30 + (8 - 5)$
$= 30 + 3$
$= 33$

3. Inverse: Addition is inverse of subtraction.
   Examples: 13 + 1 = 14
   14 - 1 = 13

$$\begin{array}{r} 91 \\ -47 \\ \hline 44 \end{array} \qquad \begin{array}{r} 44 \\ +47 \\ \hline 91 \end{array}$$

4. Identity elements: zero for addition and subtraction, one for multiplication.
   Examples: 3 + 0 = 3
   4 - 0 = 4
   1 X 6 = 6

D. Family of Facts (renaming numerals, equation form)

Example: Given 2 addends and a sum, write all the equations possible.

3 + 2 = 5 5 - 2 = 3
2 + 3 = 5 5 - 3 = 2

Write n equations renaming the numeral 7.
4 + 3 = 7 9 - 2 = 7
5 + 2 = 7 8 - 1 = 7 etc.
6 + 1 = 7 10 - 3 = 7

MATHEMATICS CONTENT CATEGORIES - GRADE 5

I. COMPUTATION

1. Addition of whole numbers
2. Subtraction of whole numbers
3. Multiplication of whole numbers
4. Division of whole numbers
5. Addition of fractions
6. Subtraction of fractions
7. Addition and subtraction of decimals

II. CONCEPTS

1. Place value of whole numbers and decimals
2. Properties
3. Factors and prime factorization
4. Metric geometry (perimeter, area, and volume)
5. Non metric geometry (lines, plane geometric figures)
6. Line and bar graphs
7. Number pairs on number plane
8. Number patterns and function rules
9. Word problems (1 and 2 step)

MATH GLOSSARY - GRADE 5

A. Number patterns

Emphasis is on completing the pattern and/or discovering the rule. May ask "What is the next number?" or "What rule did you use to find the missing number?"

Examples: a. 2, 4, 6, ?, ?, 12 (series)

b.

2	3	4	?	?
4	6	?	?	12

(input/output function)

c.

4	?	10
3	5	?
?	11	18

(magic squares)

d. [(1,3) (2,4) (?,5) (?,?)] (set of number pairs)

B. Properties

Situations often arise in the teaching of basic facts, computation, etc. where particular items may illustrate certain basic properties. However, for the log, we are interested in lesson segments where attention is given or drawn to a particular property or the lesson involves a series of computational items which involve application/use of a property. (This doesn't include lessons where the main focus is on memorizing the names and definitions of the properties--application or use is what we're interested in whether or not the students know the names of the properties.)

1. Associative (grouping):
   $8 \times (2 \times 5) = (8 \times 5) \times 2$
   $6 + (5 + 4) = (6 + 4) + 5$

2. Commutative (order):
   $A + B = B + A$
   $A \times B = B \times A$

3. Distributive: Multiplication is distributive over addition.
   $5 \times 7 = (5 \times 5) + (5 \times 2)$
   $4 \times (8 + 5) = (4 \times 8) + (4 \times 5)$

4. Inverse: Addition and subtraction are inverse operations as are multiplication and division
   $18 - 3 = 15$ $\quad$ $3 \times 6 = 18$
   $15 + 3 = 18$ $\quad$ $18 \div 3 = 6$
   $18 \div 6 = 3$

5. Identity elements: Zero is identity element for addition and subtraction and one is the identity element for multiplication and division.
   $99 + 0 = 99$ $\quad$ $99 \times 1 = 99$
   $99 - 0 = 99$ $\quad$ $99 \div 1 = 99$

C. Recognition of area and volume refers to applying concept and "counting" units illustrated rather than the use of a formula.

What is the area of the rectangular region ABCD?